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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Inventor(s): Hisao KOGA et al. Art Unit: 2631

ApplN. No.: 10/780,898

Filed: February 19, 2004

For: RECEIVING APPARATUS AND METHOD FOR DIGITAL MULTICARRIER TRANSMISSION

PETITION TO MAKE SPECIAL

Assistant Commissioner of Patents
Washington, DC 20231

Sir:

The Applicants respectfully petition that the above-captioned application be granted special status. The requirements of MPEP section 708.02(VIII) are complied with as follows:

(1) Please charge the petition fee set forth in 37 CFR 1.17(i) to Deposit Account No. 19-4375.

(2) All pending claims (claims 1-25) of the present application are believed to be directed to a single invention; if the Office determines that all the claims presented are not obviously directed to a single invention, the Applicants agree to make an election without traverse as a prerequisite to the grant of special status.

(3) A pre-examination search has been made, and an Information Disclosure Statement directed thereto is attached. The field of search is:

Class 340/subclasses 310.01-.08;

Class 370/subclasses 203, 204, 206, 208, 252, 333, 480, 485;

Class 375/subclasses 259, 308, 329, and 346;

Class 714/ subclass 746.

Examiners Douglas Olms, Jeffrey Hofsass and David Vincent were consulted for the field of search.

(4) One copy each of the prior art deemed most closely related to the subject matter encompassed by the claims is of record in the form of the art cited in the Information Disclosure Statement, submitted herewith.

(5) The following is a detailed discussion of the art of record, and comments pointing out how the instant claimed subject matter is patentably distinguishable thereover.

A. Discussion of All References of Record

USPN 6111919 to Yonge III discloses a broadband transmission method using OFDM transmission across power lines, applying an FFT operation for each received OFDM symbol, whereby phases of

subcarriers are displaced relative to phases of a reference, by a predetermined phase shift which depends on the channel frequency, until correlation is achieved and temporal alignment is determined from the amount of phase displacement required to achieve the correlation. The received phases may be obtained using a window function.

USPN 6278685 to Yonge III et al. discloses a broadband transmission method using OFDM transmission across power lines. On the transmission side, encoded data is interleaved to produce multiple copies of the encoded data which are spread in time on non-consecutive OFDM symbols in a packet of OFDM symbols and in frequency on non-adjacent carriers of the carriers in the packet of OFDM symbols. On the reception side, transmitted OFDM data is processed by receiving multiple copies of the OFDM data spread in time and frequency, and combining phase angle information for the multiple copies to produce a single metric value for use in decoding the OFDM data.

USPN 6397368 and USPN 6553534, both to Yonge III et al., disclose a transmission method using OFDM transmission across power lines. These references disclose a forward error correction technique in an OFDM channel.

USPN 6442129 to to Yonge III et al. discloses a broadband transmission method using OFDM transmission across power lines wherein channel estimation involves generating, for available modulation types, information on noise events occurring in an OFDM symbol block. The channel estimation method identifies usable carriers for a particular modulation type. A modulation type for modulation of the OFDM symbols in a standard transmission mode is selected based on channel conditions, with the identified carriers and modulation type being made available to the transmitting network node for use in a next data transmission over the data channel.

USPN 6466629 to Isaksson et al. discloses an OFDM system wherein a received multi-carrier signal is sampled and digitized before FFT processing or wavelet transform processing. The received signal is converted to a series of digitized samples, each having n bits. A detector detects when an analog signal at an input has an amplitude greater than that which can be represented by n bits, and a generator is controlled by the detector to generate m bits to represent each digitized sample, where m>n.

USPN 5959967 to Humphrey et al. discloses a digital filter for OFDM transmission over a telephone subscriber twisted pair loop. A

transmitter generates sets of time division samples in respective channels corresponding to an input data sequence comprising a series of bits. A receiver has a time variant digital filter having plural elements one for each OFDM channel, a Fourier transform unit to recover the data stream from the filter elements, and a set of wavelet filters one for each transmission channel. The wavelet filters have tap weights determined to provide specific interference rejection.

B. Discussion of How the Claimed Invention Patentably Distinguishes over the References of Record

The present invention relates to a reception section that performs carrier detection and symbol synchronization in a frequency domain in a digital wavelet multicarrier transmission system.

The references cited above, either alone or in combination, fail to disclose or suggest at least the claimed subject matter of:

(a) a reception apparatus that includes a section that performs a wavelet transform on received data and outputs complex data, a delay element that delays the complex data for one sampling period to provide delayed complex data, a complex divider that divides the first complex data and the delayed complex data to produce divided complex data that represents a phase difference

between complex subcarriers, a phase-difference distribution calculator that calculates a number of the divided complex data present within each quadrant and selects a maximal number among the calculated numbers, and a decision unit for deciding whether the received data is intended data by comparing the maximal number and a threshold (claims 1-7 and 18-25);

(b) a reception apparatus a wavelet transform section that includes M-1 one-sample delay elements, where M is positive integer greater than 2, that delays received data sequentially for one sampling period, M down samplers for down-sampling the received data and the sequentially delayed data, a prototype filter having a polyphase configuration and possessing a real coefficient for receiving the down-sampled data, and an M points fast Fourier transformer that fast Fourier transforms filtered data output from the filter; and a carrier detector that detects a carrier from the received data including a one-symbol delay element for delaying the received data by one-symbol period, a multiplier for multiplying the received data and the one-symbol delayed data, and a one-symbol moving average circuit for receiving the added data and obtaining the moving average by correlating the received data with the delayed data (claim 8);

(c) a receiving apparatus that includes an auto gain control circuit with respect to received data; a level decision unit that compares a gain level of data received from the auto gain control circuit and a threshold level; an analog to digital converter that converts an output from the auto gain control circuit to digital data; a carrier detector that decides whether the digital data is intended data based on the level decided by the level decision unit; and a symbol synchronizing circuit that synchronizing the received data output from the carrier detector (claim 9);

(d) a receiving apparatus comprising a wave detecting portion that performs a wavelet transform to received data; a carrier detection circuit that detects a carrier using data output from the wave detecting portion and a threshold that is changeable according to a condition of a transmission line; and a symbol synchronizing circuit that estimates synchronization timing utilizing data output from the carrier detection circuit (claim 10);

(e) a receiving apparatus comprising a wave detecting portion that performs a wavelet transform to received data; a selector that selects subcarriers according to a signal level of data output from the wave detecting portion; a carrier detection circuit that uses the subcarrier selected by the selector; and a symbol synchronizing

circuit that estimates synchronization timing using the subcarrier selected by the selector (claim 11);

(f) a receiving apparatus comprising a wave detecting portion that performs a wavelet transform to received data; a selector that selects subcarriers according to a signal level of a gap between adjacent frames of data output from the wave detecting portion; a carrier detection circuit that performs a carrier detection using the subcarrier selected by the selector; and a symbol synchronizing circuit that estimates synchronization timing utilizing the subcarrier selected by the selector (claim 12);

(g) a receiving apparatus comprising a first wave detecting portion that performs a wavelet transform to received data; a second wave detecting portion that performs a Fourier transform to received data; a selector that selects subcarriers according to a signal level of a gap between adjacent frames of data output from the second wave detecting portion; a carrier detection circuit that performs a carrier detection using the subcarrier selected by the selector; and a symbol synchronizing circuit that estimates synchronization timing using the subcarrier selected by the selector (claim 13) and wherein both the first wave detecting

portion and the second detecting portion share a common fast Fourier transform (claim 15);

(h) a receiving apparatus comprising a first wave detecting portion that performs a wavelet transform to received data; a second wave detecting portion that performs a Fourier transform to received data; a selector that selects subcarriers according to a signal level of a gap between adjacent frames of data output from the second wave detecting portion; a carrier detection circuit that performs a carrier detection using the subcarrier selected by the selector; and a symbol synchronizing circuit that estimates synchronization timing utilizing the data output from the first wave detecting portion (claim 14); and

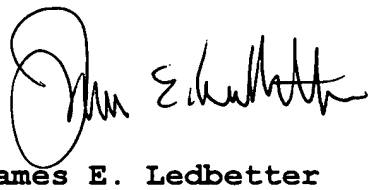
(i) a receiving apparatus comprising a data transforming device that transforms received data to transformed data utilizing a wavelet transform; a delay element that produces delayed data by delaying the transformed data; a subcarrier-pair generating device that generates a subcarrier pair from the transformed data and the delayed data; a phase-difference calculator that calculates a phase-difference between subcarrier-pairs; and a decision unit that decides received data based on the phase-difference calculated by

the phase-difference calculator (claim 16), or wherein both of the first wave detecting portion and the second wave detecting portion share a common fast Fourier transformer (claim 17).

Accordingly, in light of the foregoing discussion pointing out how the claimed invention distinguishes over the cited references, the Applicants respectfully submit that the inventions of all the presently pending claims are not anticipated by these references and would not have been obvious over any combination thereof.

Grant of special status in accordance with this petition is respectfully requested.

Respectfully submitted,



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